Databases, Containers, and the Cloud

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This presentation explains the new options of container and cloud deployments.

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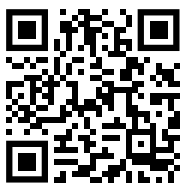

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Outline

1. Traditional database data center
2. Container features
3. Database containers
4. Cloud features
5. Databases in containers and the cloud
6. Conclusion

1. Traditional Data Centers

Punch cards

https://www.flickr.com/photos/mwichary/

Electronic & Manual Storage

IBM System/360

https://www.flickr.com/photos/simplyphotography/

All Electronic

HP 9000 N-Class server

https://www.flickr.com/photos/helixblue/

Modern

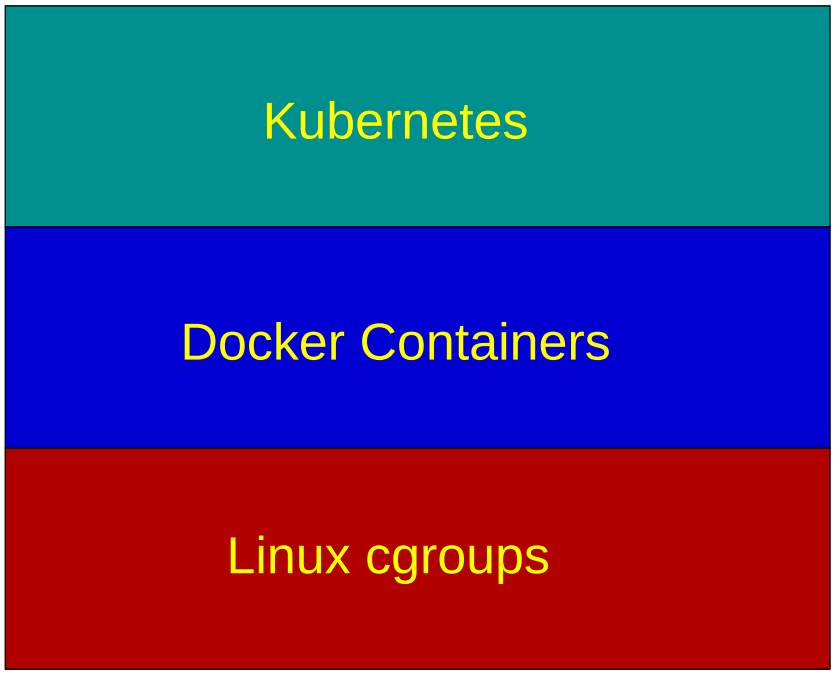
Google data center

https://www.flickr.com/photos/shiver_silver/

2. Container Features

https://www.flickr.com/photos/jaxport/

What Are Containers



Container deployment

Application container

Process isolation

cgroups

- Process isolation
- Resources control
- CPU prioritization
- Accounting
- Freezing, checkpointing, restarting

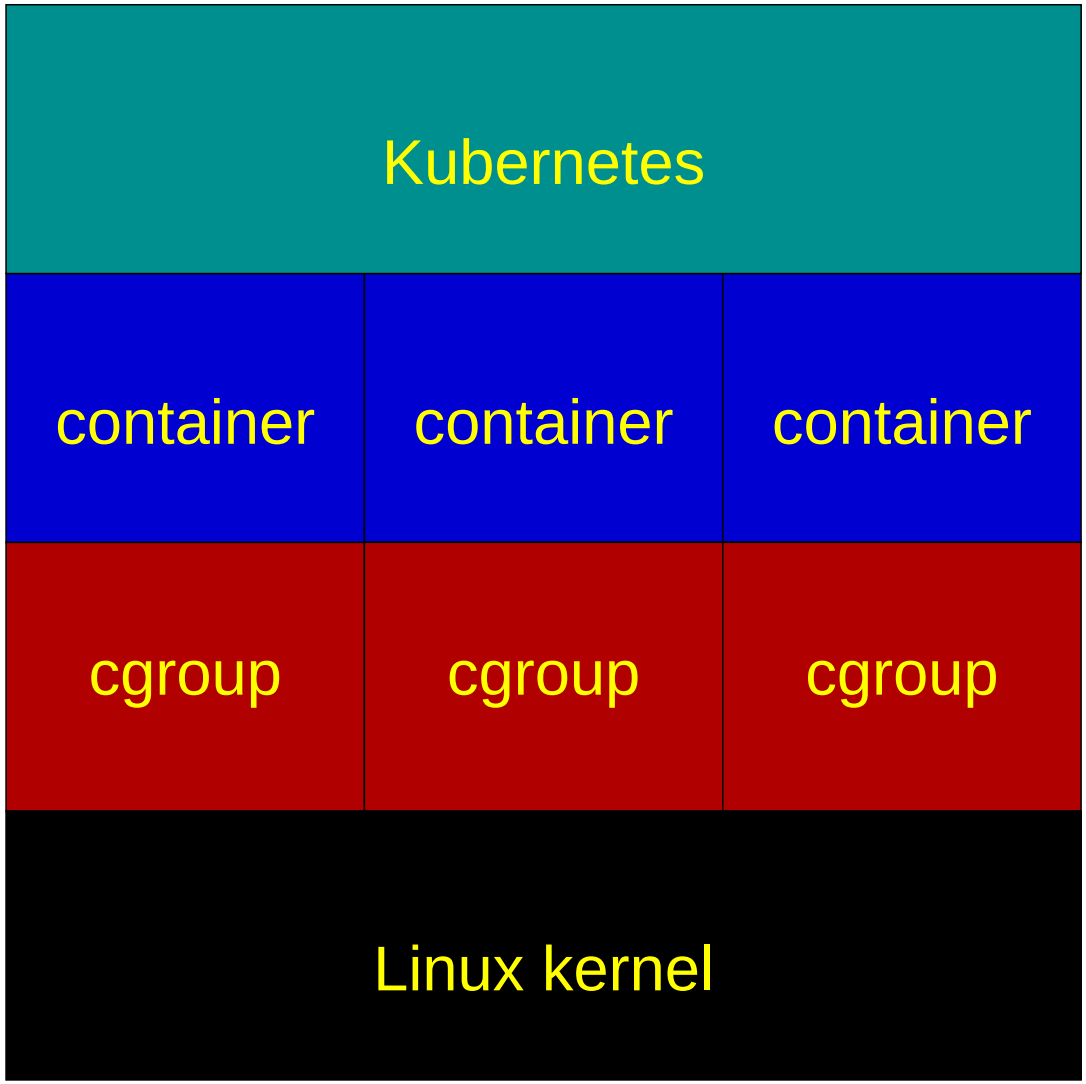
Docker

- Executables
- Libraries overlayed using a union file system
- Specification file
- Uses cgroups
- Uses namespace/network/user isolation

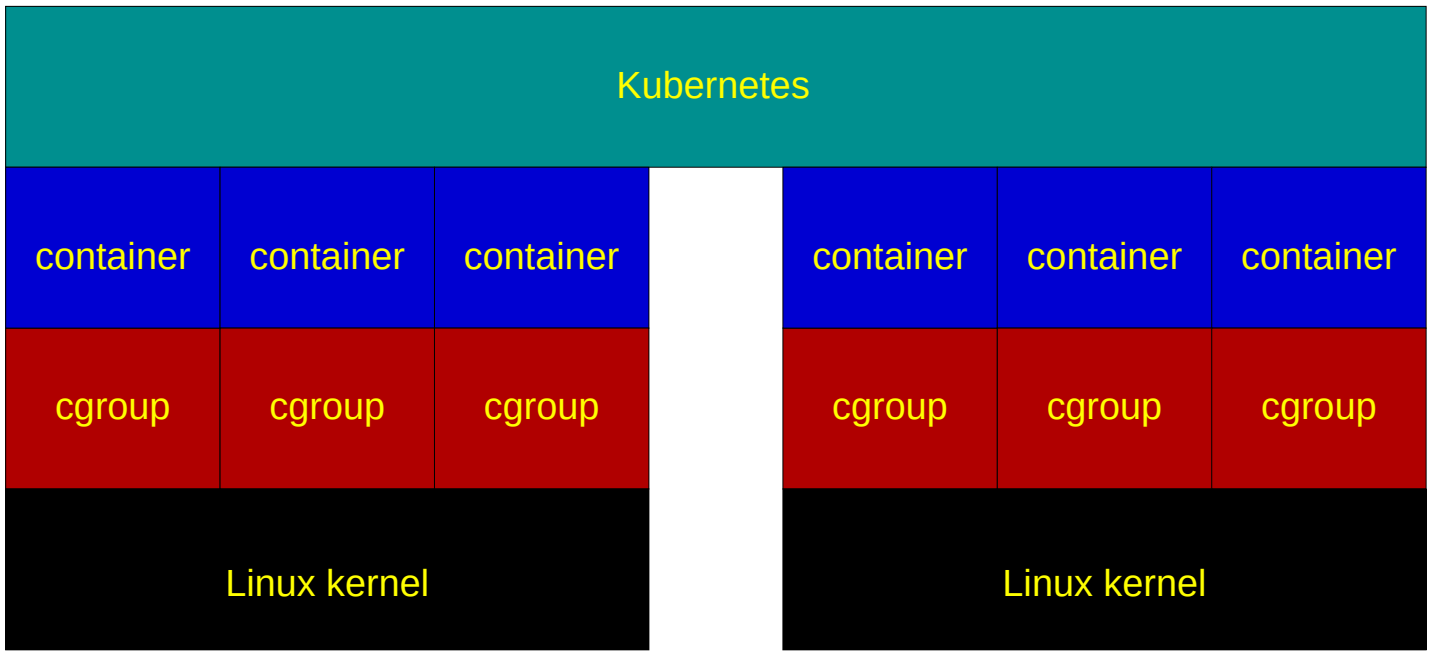
Kubernetes

- Container deployment
- Scaling
- Monitoring
- Load balancing
- Stateful sets (durable storage)

Containers Using a Single Kernel



Containers Using Multiple Kernels



3. Database Containers

Container Capability	Benefit for Databases
rapid creation/destruction	no
less overhead than VM	no
scaling	limited
migration	limited
automated deployment	yes

Containers for Database Tooling

- Backup
- Monitoring
- Failover
- Connection pooling
- Scaling

4. Cloud Features

- No physical hardware/infrastructure to maintain
- Hardware, power, and network failures handled
- Storage recovery handled
- Increase/decrease usage easily
- Less staff time

5. Databases in Containers and the Cloud

Deployment Option	Benefit for Databases
Private servers with containers	easy deployment
Private cloud (virtual machines) with containers	above, plus different operating systems
Public cloud with self-installed software	public cloud benefits (previous slide)
Public cloud with cloud-specific software	above, plus optimizations

Cloud-Specific Software

Most database software is written for generic hardware and infrastructure. Cloud-specific software can be optimized for:

- storage characteristics
- high availability/fail-over
- backup/restore
- monitoring
- scaling
- persistent memory
- GPUs and FPGAs
- Single vendor to blame

6. Conclusion

- Containers ease database deployment
- Public cloud reduces the complexity of managing hardware
- Cloud-specific software leverages cloud infrastructure

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